

A second generation of *Coenonympha arcania* (LINNAEUS, 1761) in northern Bohemia, Czech Republic

(Lepidoptera, Satyrinae)

by

TOMAS KADLEC & PAVEL VRBA

Received 21.III.2007

Summary: The authors report their observation of a putative second generation of *Coenonympha arcania* (LINNAEUS, 1761) in the Czech Republic. In 2003 and 2006 several fresh ♂♂ and ♀♀ were reported from both south-eastern Moravia and from the Ceske Stredohori Hills, in northern Bohemia. The recently increasing frequency of second-generation records seem to be related to an increasingly warm climate.

Zusammenfassung: Es wird über die Beobachtung einer vermeintlichen 2. Generation von *Coenonympha arcania* (LINNAEUS, 1761) in der Tschechischen Republik berichtet. In den Jahren 2002 und 2006 wurden mehrere frische ♂♂ und ♀♀ im südöstlichen Moravia und in den Ceske Stredohori Hills/ Nordböhmen beobachtet. Die steigende Zahl an Beobachtungen von Faltern einer 2. Generation scheint im Zusammenhang mit der beginnenden Erd Erwärmung zu stehen.

It is increasingly observed that recent climate changes influence the distribution and phenology of local butterfly faunas (for example PARMESAN et al., 1999; ROY & SPARKS, 2000; KONVICKA et al., 2003). Laboratory studies also document increasing developmental rates at higher temperatures (JAROSIK et al., 2002). As a consequence, shifts from univoltine development towards multiple generations per year are an expectable phenological response (TRAENKNER & NUSS, 2005).

Here we report on observations of a second generation of the butterfly *Coenonympha arcania* (L.) from the Ceske Stredohori Hills, Louny district, northern Bohemia, in the Czech Republic (50°23' - 50°28' N and 13°43' - 13°50' E, 180 - 560 m a.s.l.). Although situated in the north, the region is situated in the warmest part of the country (thermophytikum) owing to its low height, basaltic bedrock, and because it lays in the rain shadow of the nearby Krusne Hory Mts. (= Erzgebirge). Typical *C. arcania* (L.) habitats are scrubby forest-steppes on warm slopes of volcanic hills.

On 20 September, 2003, Zbynek Havelda recorded two male *C. arcania* (L.) on the scrubby eastern slope of Mila hill, north-west of the town of Louny. In 2006, while carrying out a detailed mark-recapture study of another satyrid, *Chazara briseis* (LINNAEUS, 1764), we also recorded three *C. arcania* (L.) during the middle of the same month - two ♀♀ on 13 and 14 September, and a ♂ on 17 September, all on Rana Hill, north of Louny. The butterflies were all in good condition, either fresh or with only slightly worn wings, and were found in scrubby, semi-open, xerothermic biotopes. Wing patterns, as well as the biotope

preference, were the same as in the butterflies from the first generation (BENES et al., 2002). Both 2003 and 2006 were unusually warm (data from the Czech Hydrometeorological Institute).

It is highly unlikely that the butterflies belonged to a prolonged first generation. We spent the entire 2006 season in the area, recording all butterflies on a daily basis, and the last first-generation records of *C. arcania* (L.) (which concerned worn ♀♀) were on 18 July. Also, the presence of ♂♂ in good condition in September does not correspond with the protandry of the species (ZIMMERMAN, 2003).

Until recently the literature mentioned just one generation per annum for *C. arcania* (L.) (EBERT & RENNWALD, 1991; TOLMAN & LEWINGTON, 1997; BINZENHOFER et al., 2005) but then late-season individuals were observed in Hessen in 2006 (ERNST, 2006). In the Czech Republic, adults normally fly from the beginning of May to the first half of August (BENES et al., 2002). However, recent database entries in the Czech butterfly database [CBD] contain two further records that can be attributed to a second generation: these were dated 25 August 2004 (Lhanice, 49°06' N and 16°13' E, recorder J. HEPP, < 10 individuals) and 4 September 2005 (White Carpathian Mts., 48°51' N and 17°35' E, recorder J. NEMY, < 10 individuals). In contrast to our own observations, these records originated in the south-eastern region of the Czech Republic (Moravia), a region from which second generation of *C. arcania* (L.) had been previously reported as a rare event (SCHWARZ, 1948).

The relatively high number of recent observations of a second generation of butterflies in a usually univoltine species is consistent with the effects of climatic warming. These processes could dramatically change butterfly phenology and species compositions in their communities.

Acknowledgements: We thank ZBYNEK HAVELDA for allowing us to use his observations, and the Society for Butterfly Conservation and Institute of Entomology, Czech Academy of Science (JIRI BENES, MARTIN KONVICKA), for recent *C. arcania* (L.) entries from the Czech Butterfly Database. Our research in northern Bohemia was supported by the Czech Republic's Ministry of Education (LC06073) and Agency of Nature and Landscape Conservation (VaV/620/1/03).

References

- BENES, J., KONVICKA, M., DVORAK, J., FRIC, Z., HAVELKA, Z., PAVLICKO, A., VRABEC, V. & Z. WEIDENHOFFER (eds.) (2002): Butterflies of the Czech Republic: Distribution and Conservation. I., II. - SOM, Prague.
- BINZENHOFER, B., SCHRODER, B., STRAUSS, B., BIEDERMANN, R. & J. SETTELE (2005): Habitat models and habitat connectivity analysis for butterflies and burnet moths The example of *Zygaena carniolica* and *Coenonympha arcania*.— Biol. Cons. **126**: 247-259, Montpelier.
- EBERT, G. & E. RENNWALD (1991): Die Schmetterlinge Baden-Württembergs. Band 1: Tagfalter 2. Eugen Ulmer Verlag, Hohenheim.
- ERNST, M. (2006): Späte Beobachtung von *Coenonympha arcania* (LINNAEUS, 1761) 2006 in der Hessischen Oberrheinebene (Lepidoptera: Nymphalidae, Satyridae). Nachr. Ent. Ver. Apollo **27**: 204, Frankfurt.

- JAROSIK, V., HONEK, A. & A.F. G. DIXON (2002): Developmental rate isomorphy in Insects and Mites. – Amer. Nat. **160**: 497-510, Chicago.
- KONVICKA, M., MARADOVA, M., BENES, J., FRIC, Z. & P. KEPKA (2003): Uphill shifts in distribution of butterflies in the Czech Republic: effects of changing climate detected on a regional scale. - Global Ecology and Biogeography **12**: 403–410, Oxford.
- PARMEZAN, C., RYRHOLM, N., STEFANESCU, C., HILL, J. K., THOMAS, C. D., DESCIMON, H. et al. (1999): Poleward shifts in geographical ranges of butterfly species associated with regional warming. - Nature **399**: 579–583, London.
- ROY, D. B. & H. SPARKS (2000): Phenology of British butterflies and climate change. – Global Change Biology **6**: 407-416, Oxford.
- SCHWARZ, R. (1948): Mot"li, I. [Butterflies, I.]. – Vesmir, Prague.
- TOLMAN, T. & R. LEWINGTON (1997): Butterflies of Britain and Europe. - Harper and Collins, London.
- TRAENKNER, A. & M. NUSS (2005): Risk spreading in the voltinism of *Scolitantides orion* (Pallas, 1771) (Lycaenidae). - Nota Lep. **28**: 55-64, Dresden.
- Zimmermann, K. (2003) Diurnální aktivita a distribuce oká e strdivkového *Coenonympha arcania* (Lepidoptera: Satyridae) na strukturovaném sukcesním gradientu [Diurnal activity and distribution of adult *Coenonympha arcania* (Lepidoptera: Satyridae) on a successional gradient of habitats] Unpublished diploma thesis, School of Biological Sciences, University of Sourthern Bohemia, eské Budjovice.

Internet source: www.chmi.cz – Czech Hydrometeorological institute

Addresses of the authors

TOMAS KADLEC
Department of Ecology
Faculty of Science, Charles University in Prague
Vinicna 7
CZ – 128 44 Praha 2

PAVEL VRBA
Department of Zoology
Faculty of Science, Charles University in Prague
Vinicna 7
CZ– 128 44 Praha 2